THIN FILM BASED MAGNETOIMPEDANCE SENSOR FOR MAGNETIC NEEDLE POSITION INDENTIFICATION

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Magnetic field sensors are widely employed in non-destructive testing and bio-medical applications. One of the most sensitive methods for detection stray fields of magnetic objects is the giant magnetic impedance (GMI) effect [1-2]. GMI consists in a change of the total impedance (Z) of a ferromagnetic conductor under application of an external magnetic field. The precise detection of magnetic objects in a human body is important for practical surgery. We therefore propose to develop thin film based GMI sensor for magnetic needle position identification.

$[Cu(3nm)/Fe_{22}Ni_{78}(100nm)]_5/Cu(500nm)/[Fe_{22}Ni_{78}(100nm)/Cu(3nm)]_5$ multi-layers were prepared by magnetron sputtering deposition onto glass substrates. The structure was investigated by scanning electron microscopy and X-ray diffraction analysis. The saturation magnetization of films was measured using a vibration sample magnetometer, the coercive force and anisotropy field were obtained from hysteresis loops from a magneto-optical Kerr microscope. The GMI was measured by automatic system with Agilent HP e4991A impedance analyzer. The GMI ratio ($\Delta Z/Z$) was calculated as follows: $\Delta Z/Z= (Z(H_{max})-Z(H))/Z(H_{max})$.

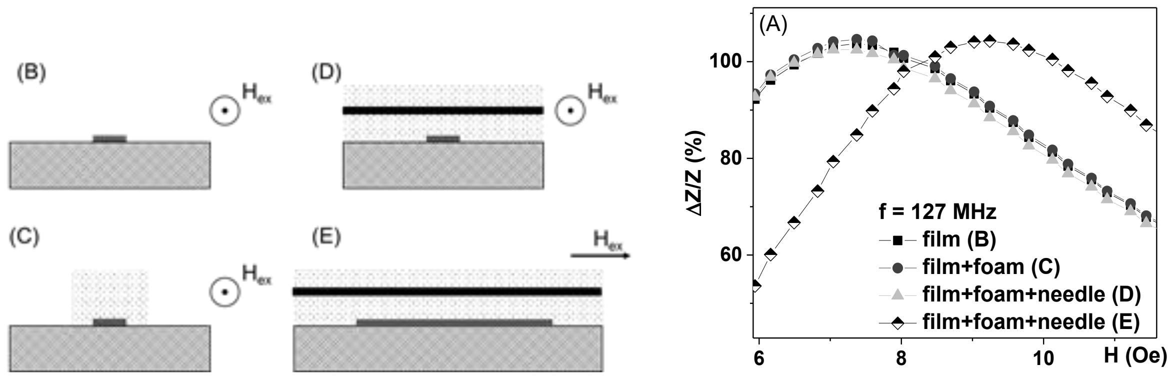

Fig. 1. (A) Field dependencies of magnetoimpedance ration of total impedance for measurements without and with needle. Needle identification experiment: (B) thin film on substrate; (C) thin film with foam on it; (D) thin film with needle inside foam perpendicular of the long side of film; (E) thin film with needle inside foam parallel of the long side of film.

Figure 1 shows field dependencies of magnetoimpedance ration of total impedance (A) and the scheme of the experiment (B-E). The presence of the foam did not change the magnitude of the magneto impedance ratio. $\Delta Z/Z$ decreased by 2% in the field of small fields with the steel needle in the foam at a distance of 0.5 cm from the multilayer element, perpendicular to the long side of the element (Fig. 1(D)). A significant change in the peak position of the magnetoimpedance ratio from 7.3 to 9.2 Oe was observed when the needle was placed parallel to the long side of the element (Fig. 1(E)). It was found that the multilayer element can be used to detect the position of the needle at a distance from the element. The dependence of the magnetoimpedance ratio of all components of the impedance on the position of the needle in foam rubber will be presented in the report.

The reported study was funded by RFBR according to the research project № 18-32-00094.

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ВЛИЯНИЕ СПЕЦИАЛЬНЫХ ГРАНИЦ НА ТЕКСТУРУ РЕКРИСТАЛЛИЗАЦИИ ГЦК-МЕТАЛЛОВ С ВЫСОКОЙ ЭНЕРГИЕЙ ДЕФЕКТА УПАКОВКИ

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EFFECT OF SPECIAL BOUNDARIES ON RECRYSTALLIZATION TEXTURE OF FCC METALS WITH HIGH PACKING DEFECT ENERGY

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The features of recrystallization texture are investigated by the method of orientation microscopy (EBSD) in rolled aluminum wire. Strict crystallogeometric correlations between deformation orientations and recrystallization orientations are the result of the dominant role in structural transformations of special misorientations - the special boundaries, which is close to Σ25b or Σ45c in the CSL model.

Подавляющее большинство технологий производства функциональных изделий из металлических материалов включает стадии деформаций и отжигов, в процессе которых, формируется определенная кристаллографическая текстура. Практический интерес к текстурам связан с тем, что их наличие приводит к анизотропии физических свойств, прочности и пластичности, а также склонности материала к разрушению [1]. Сформированная в материале на определенном переделе текстура, при последующих обработках (отжигах, деформациях), через